

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099
1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	

BE IT KNOWN THAT WE, Toru Okawa, a citizen of Japan residing at c/o FUJITSU LIMITED, 1-1, Kamikodanaka 4-chome, Nakahara-ku, Kawasaki-shi, Kanagawa, 211 Japan, Ryuichi Matsukura, a citizen of Japan residing at c/o FUJITSU LIMITED, 1-1, Kamikodanaka 4-chome, Nakahara-ku, Kawasaki-shi, Kanagawa, 211 Japan and Yasuo Sato, a citizen of Japan residing at c/o FUJITSU LIMITED, 1-1, Kamikodanaka 4-chome, Nakahara-ku, Kawasaki-shi, Kanagawa, 211 Japan have invented certain new and useful improvements in

of which the following is a specification : -

1 TITLE OF THE INVENTION

DISPLAY CONTROL SYSTEM CAUSING IMAGE ON
DISPLAY SCREEN TO DISAPPEAR AND REAPPEAR IN A FRIENDLY
MANNER TO USER

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BACKGROUND OF THE INVENTION

(1) Field of the Invention

The present invention generally relates to a
display control system which is constituted in a data
processing apparatus, such as a portable remote
computer terminal or a general purpose computer, ^{and} ~~more particularly~~ ^{and method} to a display control system, which
causes an image on a display screen to disappear and
reappear in a friendly manner to a user.

15

(2) Description of the Related Art

In recent years, persons who are not
specialists in computer technology have started using
computers (data processing apparatuses). It is
desirable that not only functions and performance of
the computers be improved, but also that users who are
not specialists in the computer technology can enjoy
using the computers.

In conventional computers, a high importance
is placed on improving functions and performance. For
example, ^{in the case} ~~in a case~~ of a process for making data (e.g.,
character images and/or graphical images) on a display
screen disappear, attention is mainly paid to how the
data can disappear from the display screen at a high
speed and by use of a small amount of software. ^{In the} ~~In a~~
case of a process for selecting a menu item from a
menu shown on a display screen, ~~our~~ attention is
mainly paid to how the menu item can be selected at a
high speed and by use of a small amount of software.

However, according to the conventional
developing concept for the computers as described
above, although the functions and performance of the
computers can be improved, the computers are not

Thus, the applicant has proposed a data processing apparatus in which data disappears from and reappears on a display screen in a friendly manner.

10 It is desirable that an appearance and
disappearance manner of the data on the display screen
be more friendly to users.

SUMMARY OF THE INVENTION

A specific object of the present invention is to provide a display control system which can cause data (e.g., character images and/or graphical images) on a display screen to gradually disappear and reappear in more friendly manners to users.

The above objects of the present invention are achieved by a display control system for controlling data which is displayed on a screen of a display unit, the system comprising: pointing means for pointing to a position on the screen of the display unit; deleting means for gradually deleting elements of data from the screen of the display unit as if the elements were gradually being sucked at the position pointed to by the pointing means; and density control means for controlling the density of elements remaining on the screen of the display unit so that

1 the density is gradually decreased in accordance with
suction of the elements.

5 The above objects of the present invention
are also achieved by a display control system for
controlling data which is displayed on a screen of a
display unit, the system comprising: pointing means
for pointing to a position on the screen of the
display unit; deleting means for gradually deleting
elements of data from the screen of the display unit
10 as if the elements were gradually being sucked at the
position pointed to by the pointing means; and speed
control means for controlling a speed at which the
elements are gradually deleted so that the speed is
gradually increased in accordance with suction of the
15 elements.

20 The above objects of the present invention
are also achieved by a display control system for
controlling data which is displayed on a screen of a
display unit, the system comprising: pointing means
for pointing to a position on the screen of the
display unit; restoring means for gradually restoring
elements of data on the screen of the display unit as
if the elements were welling up from the position
pointed to by the pointing means; and density control
25 means for controlling the density of elements restored
on the screen of the display unit so that the density
is gradually increased in accordance with appearance
of the elements.

30 The above objects of the present invention
are also achieved by a display control system for
controlling data which is displayed on a screen of a
display unit, the system comprising: pointing means
for pointing to a position on the screen of the
display unit; restoring means for gradually restoring
elements of data on the screen of the display unit as
35 if the elements were welling up from the position
pointed to by the pointing means; and speed control

1 means for controlling a speed at which the elements
are gradually restored so that the speed is gradually
decreased in accordance with appearance of the
elements.

5 According to the present invention, while
the elements of the data are being gradually deleted
and restored, the density of the elements or the speed
at which the elements are deleted are controlled. As
a result, the elements of the data can be gradually
10 deleted from the screen of the display unit as if the
elements were being sucked at the position pointed to
(pointed position) more realistically, and the
elements of the data can be gradually restored on the
screen of the display unit as if the elements were
15 welling up from the pointed position more
realistically. Thus, data can disappear from and
reappear on the screen on the display unit in a manner
more friendly to a user.

20 Another object of the present invention is
to provide a data processing apparatus in which menu
items can be displayed on a limited area of the
display screen so as to be easily selected by a user.

This object of the present invention is
achieved by a data processing apparatus in which a
25 process corresponding to a menu item selected from
menu items displayed on a screen of a display unit is
executed, comprising: pointing means for pointing to a
menu on the screen of the display unit; control means
for, in response to a pointing operation of the
30 pointing means, causing menu items included in the
menu pointed to by the pointing means to be display at
a position on the screen of the display unit one by
one in turns at predetermined intervals; detecting
means for detecting a predetermined operation; and
35 selecting means for selecting, as a menu item to be
activated, a menu item displayed on the screen of the
display unit when the detecting means detects the

According to the present invention, menu items included in a pointed menu are displayed one by one in turns at predetermined interval on the screen of the display unit. That is, all the menu items which can be selected are not simultaneously displayed on the screen of the display unit. A menu item which is displayed when the predetermined operation is performed is then selected. Thus, menu items can be displayed on a limited area of the display screen so as to be easy to be selected by a user.

15 Other objects, features and advantages of the present invention will be apparent from the following description when read in conjunction with the accompanying drawings, in which:

Fig. 2 is a block diagram illustrating an example of a hardware constitution of the data processing apparatus according to the first embodiment of the present invention;

30 Figs. 4A and 4B are diagrams illustrating an example of movement of elements of data which are being deleted from the display screen;

35 Fig. 6 is a diagram illustrating another example of movement of elements of data which are being deleted from the display screen;

1 Fig. 7 is a flowchart illustrating a process
for restoring data on the display screen;

 Fig. 8 is a flowchart illustrating a process
for controlling a speed at which the data is deleted;

5 Fig. 9 is a flowchart illustrating a process
for controlling a speed at which the data is restored;

 Fig. 10 is a functional block diagram
illustrating a data processing apparatus including a
display control system according to a second
10 embodiment of the present invention;

 Fig. 11 is a block diagram illustrating an
example of a hardware constitution of the data
processing apparatus according to the second
embodiment of the present invention;

15 Fig. 12 is a flowchart illustrating a
process for displaying menu items; and

 Fig. 13 is a diagram illustrating a menu bar
and menu items which are displayed on a display
screen.

20

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

 A description will now be given of a first
embodiment of the present invention.

 A data processing apparatus according to the
25 first embodiment of the present invention is
functionally formed as shown in Fig. 1. Referring to
Fig. 1, the data processing apparatus 1 has a display
unit 50, a pointing device 51 and a keyboard 52. The
pointing device 51 is, for example, a mouse. The data
30 processing apparatus 1 further has an input/output
controller 13, a data management unit 14, an area
management unit 15, a display data generating unit 16,
an image memory 17, a detecting unit 18, a deleting
unit 19 and a working memory 20.

35 Data (e.g., character images and/or
graphical images) is displayed on a screen of the
display unit 50. The pointing device 51 points to

The data management unit 14 manages data to be displayed on the screen of the display unit 50. The area management unit 15 manages area information indicating an area in which the data managed by the data management unit 14 should be displayed on the screen of the display unit 50.

30 The deleting unit 19 performs a process for deleting data within the area detected by the detecting unit 18. In this process, the data (e.g., character images and/or graphic images) is deleted as if the data was convergently being sucked at a position pointed to by the pointing device 51. The working memory 20 is used for the process performed by the deleting unit 19.

35 The deleting unit 19 has a first specifying
block 21, a first density control block 22, a first
speed control block 23 and a completion data output

1 block 24. The first specifying block 21 specifies
data which should be deleted from the screen of the
display unit 50 as if the data was convergently being
sucked at a position. The first density control block
5 22 controls the density of data displayed on the
screen of the display unit 50 so that the density is
gradually decreased in accordance with the convergent
suction of the data. The first speed control block 23
controls the speed at which the data is convergently
10 sucked at the position on the screen of the display
unit 50, in accordance with the convergent suction of
the data. The completion data output block 24 causes
completion data to be displayed at a position near the
position into which the data is convergently sucked,
15 when the process of the convergent suction of the data
is completed.

The display data generating unit 16 has a
restoring unit 25 and an exclusion unit 27. The
restoring unit 25 restores the data which was deleted
20 from the screen of the display unit 50 by the deleting
unit 19. The data is restored on the screen of the
display unit 50 so as to well up from a position
pointed by the pointing device 51. A setting unit 26
sets information indicating a type (e.g., graphics,
25 text or the like) of data in accordance with an
instruction input from the keyboard 52. The exclusion
unit 27 excludes the type, indicated by information
set by the setting unit 26, of data from the data
which should be restored by the restoring unit 25.

30 The restoring unit 25 has a second
specifying block 28, a second density control block 29
and a second speed control block 30. The second
specifying block 28 specifies data which is to be
restored on the screen of the display unit 50. The
35 second density control portion 29 controls the density
of data which is being restored so that the density is
gradually increased in accordance with appearance of

5 In the data processing apparatus 1 having
the above structure, the detecting unit 18 detects an
area including a position pointed to (pointed
position) by the pointing device 51 on the screen of
the display unit 50. The deleting unit 19 then
10 deletes data within the detected area, out of the data
expanded on the image memory 17, from the screen of
the display unit 50 using the working memory 20 as if
the data was convergently being sucked at the pointed
position.

30 When a request for restoration of the data
which was deleted by the deleting unit 19 is received
by the restoring unit 25, the restoring unit 25
restores, on the screen of the display unit 50, the
data which was deleted so that the data wells up from
35 the position pointed to by the pointing device 51.
While the data is being restored so as to well up, the
second density control block 29 of the restoring unit

1 25 controls the density of the data restored on the
screen so that the density is gradually increased in
accordance with appearance of the data. The second
5 speed control block 30 of the restoring unit 25
controls the speed at which the data wells up on the
screen in accordance with the appearance of the data.

According to the data processing apparatus 1
as described above, while the data (such as character
images and/or graphical images) is being deleted as if
10 the data was convergently being sucked at a position
on the screen of the display unit 50, the density of
the remaining data is gradually decreased in
accordance with the convergent suction of the data.
The speed at which the data is convergently sucked is
15 controlled in accordance with the convergent suction
of the data. Further, while the data is being
restored as if the data was welling up from a position
on the screen of the display unit 50, the density of
the data is gradually increased in accordance with the
20 appearance of the data. The speed at which the data
wells up is controlled in accordance with the
appearance of the data. Thus, the data can disappear
and appear from the screen of the display unit 50 in a
more friendly manner to the user.

25 The data processing apparatus as described
above may be formed, for example, using a general
purpose computer system (e.g., a personal computer).
In this case, the computer system has hardware as
shown in Fig. 2. Referring to Fig. 2, the computer
30 system 100 has the display unit 50, the pointing
device 51, such as a mouse, and the keyboard 52. The
computer system 100 further has a controller 54, a
hard disk unit 53 (HD), a memory unit 55 and a floppy
disk drive unit 56 (FDD).

35 The controller 54 includes a CPU (Central
Processing Unit) which performs various processes
corresponding to the functions of the data processing

1 apparatus as described above. The hard disk unit 53
stores data files which may be processed in the
computer system 100. Application programs may be
5 stored in the hard disk unit 53. The memory unit 55
includes an image memory, a working memory and various
types of memories (a RAM and a ROM) for storing data
and programs. The floppy disk drive 56 drives a
floppy disk (FD) loaded therein, and data read out
10 from the floppy disk (FD) is supplied from the floppy
disk drive unit 56 to the controller 54. A program
corresponding to the functions of the data processing
apparatus described above is supplied as a part of an
application program, such as a word-processing
15 application program or a graphic processing
application program, to this computer system 100 from
floppy disks. The application program read out from
the floppy disks by the floppy disk drive unit 56 is
installed into the hard disk unit 53 under the control
20 of the controller 54. The CPU in the controller 54
executes processes in accordance with the application
program using a predetermined memory (a RAM) in the
memory unit 55. As a result, for example, a file
stored in the hard disk unit (HD) 53 is opened, and
25 data (e.g., character images and/or graphical images)
on a page of the opened file is then displayed on the
screen of the display unit 50.

A user inputs a "deletion request" using the
keyboard 52 to delete data on the page of the opened
file. In response to the "deletion request", the CPU
30 of the controller 54 starts a process in accordance
with a procedure shown in Fig. 3.

Referring to Fig. 3, the CPU is waiting for
an input operation in step S1. When the CPU detects
that an input operation is performed, the CPU
35 determines, in step S2, whether or not the input
operation is an operation for setting a window on the
screen of the display unit 50. If the operation for

After the data to be deleted is set as described above, the CPU starts steps for deleting the data. In step S7, elements of the data (e.g., characters of a character image, image blocks of graphical image, pixels of an image or the like) within the specified window are thinned in accordance with a predetermined rule. Remaining elements in the window are then moved toward the pointed position convergently so as to be close to each other. As a

1 result, reduced data (a reduced image) is formed of
the remaining elements. The reduced data is set as
new data to be deleted. The CPU then causes the
density of the reduced data to be decreased by one
5 rank, in step S8. For example, the number of colored
dots (e.g., black dots) included in the elements
forming the reduced data is decreased by one rank in
accordance with a predetermined rule.

After this, the CPU determines, in step S9,
10 whether or not all the elements of the data in the
window have been deleted. If all the elements in the
window have not yet been deleted, the process returns
to step S7. After this, steps S7 and S8 are
repeatedly executed until all the elements in the
15 window are deleted. If the CPU determines, in step
S9, that all the elements in the window have been
deleted, the CPU causes the display unit 50 to display
a column of smoke (meaning that all the data have been
completely deleted) at a position near the pointed
20 position on the screen, in step S10.

While step S7 is repeatedly being executed,
the data (the image) within the specified window is
reduced and deleted, for example, in accordance with a
rule as shown in Fig. 4A.

25 Referring to Fig. 4A, data to be deleted is
formed of elements arranged in a matrix. Every time
step S7 is executed, elements on odd lines (1, 3,
5, ...) in row and column directions are deleted. The
remaining elements (indicated by \otimes) are then
30 convergently moved toward the pointed position so as
to be close to each other. As a result, while step S7
is repeatedly being executed, the data (e.g., a
character image) is gradually reduced as if the data
was being sucked at the pointed position, as shown in
35 Fig. 4B. Finally, the data is completely deleted from
the screen of the display unit 50.

In a case where a position P_0 is pointed to

1 in a window W as shown in Fig. 5, the elements of the data in the window W are thinned as follows.

When the position P_o is pointed to in the window W, the window W is divided into areas $E_1 (X_A \times Y_A)$, $E_2 (X_B \times Y_A)$, $E_3 (X_A \times Y_B)$ and $E_4 (X_B \times Y_B)$. While the elements arranged in the row direction (X) in each of the areas E_2 and E_4 are being repeatedly thinned the number X_B of times, the elements arranged in the row direction (X) in each of the areas E_1 and E_3 are being repeatedly thinned the number X_A of times. In addition, while the elements arranged in the column direction (Y) in each of the areas E_1 and E_2 are being repeatedly thinned the number Y_A of times, the elements arranged in the column direction (Y) in each of the areas E_3 and E_4 are being repeatedly thinned the number Y_B of times. According to the above manner in which the elements in the respective areas E_1 , E_2 , E_3 and E_4 are deleted, the elements in the respective areas E_1 , E_2 , E_3 and E_4 are approximately simultaneously deleted.

A step for pivoting reduced data obtained in step S7 about the pointed position by a predetermined angle may be added after step S7 or S8. In this case, the elements of the data can be moved toward the pointed position as if the elements were spirally sucked at the pointed position.

The elements can be also moved spirally in a manner as shown in Fig. 6. In this case, every time an element in contact with a predetermined side of the pointed position P_o is deleted, the elements are spirally moved toward the pointed position P_o .

As has been described above, in response to the "deletion request", the elements of the data in the specified window on the screen of the display unit are deleted as if the elements were convergently sucked at the pointed position in the specified window. Further, while elements are being deleted so

1 that the data is reduced, the density of the reduced
data is gradually decreased in accordance with the
suction of the elements. Thus, the data can be
deleted from the screen of the display unit 50 as if
5 the data was realistically sucked at a point.

In the process shown in Fig. 3, steps shown
in Fig. 7 may be added after step S8 or substituted
for step S8. In the following embodiment, for
example, steps shown in Fig. 7 are substituted for
10 step S8 shown in Fig. 3. Due to a process of steps
shown in Fig. 7, the speed at which the elements of
the data are deleted is increased in accordance with a
degree of deletion of the elements.

After the reduced data is obtained in step
15 S7 shown in Fig. 3, the CPU starts a process of steps
shown in Fig. 7. Referring to Fig. 7, the CPU reads a
count value i of an internal counter in step S21. The
internal counter has already been initialized at "0".
The CPU determines, in step S22, whether the count
20 value i is less than a first reference value i_0
($i < i_0$). If the count value i is less than the first
reference value i_0 , a delay timer having a first delay
time (1) is activated in step S23. After the first
delay time (1) elapses, the CPU causes the count value
25 i of the internal counter to increment by one ($i \rightarrow i+1$)
in step S24. After this, step S9 shown in Fig. 3 is
executed.

Until the count value i of the internal
counter reaches the first reference value i_0 , step S7
30 shown in Fig. 3 and steps S21, S22, S23 and S24 shown
in Fig. 7 are repeatedly executed. As a result, a
process for reducing the data in step S7 is repeatedly
executed at first intervals each of which corresponds
to the first delay time (1).

35 When the count value i of the internal
counter reaches the first reference value i_0 , the CPU
further determines, in step S25, whether the count

1 value i of the internal counter is within a range
between the first reference value i_0 and a second
reference value i_1 greater than the first reference
value i_0 ($i_0 \leq i < i_1$). If the count value i is within
5 the range ($i_0 \leq i < i_1$), a delay timer having a second
delay time (2) is activated in step S26. The second
delay time (2) is less than the first delay time (1)
described above. After the second delay time (2)
elapses, the CPU causes the count value i of the
10 internal counter to increment by one ($i \rightarrow i+1$) in step
S24. In this case, until the count value i of the
internal counter reaches the second reference value
 i_1 , step S7 shown in Fig. 3 and steps S21, S22, S25,
S26 and S24 are repeatedly executed. As a result, the
15 process for reducing the data in step S7 is repeatedly
executed at second intervals each of which corresponds
to the second delay time (2). Since the second
intervals corresponding to the second delay time (2)
are less than the first intervals corresponding to the
20 first delay time (1), the speed at which the data is
reduced (the elements of the data are deleted) is
increased.

Further, if the count value i exceeds the
second reference value i_1 ($i > i_1$), the steps S7 is
25 executed every time the count value i is incremented
by one without a delay time. As a result, the speed
at which data is reduced (the element of the data are
deleted) is further increased.

According to the above process, the speed at
30 which the elements of the data are deleted is
gradually increased in accordance with the degree of
the deletion of the elements. Thus, it appears that
the elements (e.g., characters) of the data (e.g., a
character image) can be more really sucked at the
35 pointed position convergently.

A user inputs a "restoration request" using
the keyboard 52 to restore data which was deleted. In

1 response to the "restoration request", the CPU of the
controller 54 starts a process in accordance with a
procedure shown in Fig. 8.

Referring to Fig. 8, the CPU is waiting for
5 an input operation in step S31. If the input
operation is performed, the CPU further determines, in
step S32, whether the input operation is an operation
for specifying data to be restored. If the operation
for specifying data to be restored is performed, the
10 CPU sets the data to be restored in the working memory
in step S33. After this, the CPU is waiting an input
operation again in step S34. If an input operation is
performed, the CPU further determines, in step S35,
whether the input operation is an instruction of an
15 exclusion operation. The exclusion operation is an
operation for excluding a type of data (e.g., a
graphical image, a character image, and/or a numeral
image) from the data which has been set as the data to
be restored. If the instruction of the exclusion
20 operation is input, the CPU executes the exclusion
operation, in step S36, so that one or a plurality of
types of data are excluded from the data to be set as
the data to be restored. After this, the CPU is
waiting for an input operation again in step S37. If
25 an input operation is performed, the CPU determines,
in step S38, whether the input operation is an
operation for pointing to a position on the screen of
the display unit 50 using the pointing device 51. If
the operation for pointing to a position is performed,
30 the CPU detects (recognizes) the pointed position in
step S39.

If the exclusion operation is not performed,
all the data initially specified by the user is set as
the data to be restored. In addition, if the CPU
35 determines, in steps S43, that an operation for
canceling the process has been performed, the CPU ends
the process.

1 After the CPU detects (recognizes) the
pointed position in step S39, the CPU starts a process
for restoring the data on the screen of the display
unit 50. In step S40, elements are selected from the
5 data to be restored in accordance with a rule
inversely related to the rule in which the elements of
the data to be deleted are thinned as described above
(see Fig. 4A). The selected elements are rearranged
and displayed so as to be close to each other at
10 positions including the pointed position on the screen
of the display unit 50. The displayed elements are
expanded on the screen of the display unit 50 in
accordance with a rule inversely related to the rule
in which the elements are moved toward the selected
15 point so as to move close to each other to form the
reduced data as described above (see Figs. 4A and 4B).
Step S40 is executed once, so that the data is
partially restored on the screen of the display unit
50. Data formed of the elements which are expanded is
20 referred to, for example, as sparse data. The sparse
data obtained in step S40 has a density (initially at
a minimum value).

 In step S41, the CPU causes the density of
the sparse data obtained in step S40 to be increased
25 by one rank. For example, the number of colored dots
(e.g., black dots) included in each of the elements of
the sparse data is increased by one rank in accordance
with a predetermined rule. After this, the CPU
determines, in step S42, whether all the elements of
30 the data set as the data to be restored are restored
on the screen of the display unit 50. If there are
elements to be restored, the process returns to step
S40.

 In step S40 at this time, elements are
35 selected from the data to be restored in accordance
with the rule described above. The selected elements
are then added to the sparse data so that all elements

1 are close to each other. All the elements are
expanded in accordance with the rule described above
so that new sparse data is obtained. After this, in
step S41, the density of the sparse data is increased
5 by one rank in the manner described above. Until all
elements of the data set as the data to be restored
are restored, the process in steps S40 and S41 is
repeatedly executed. As a result, the elements of the
data are restored on the screen of the display unit 50
10 as if the elements welled up from the pointed
position. The density of the data restored on the
screen of the display unit 50 is gradually increased
in accordance with increasing of the number of
elements forming the data restored on the screen.

15 According to the above process in response
to the "restoration request" from the user, the data
is restored on the screen of the display unit 50 as if
the data welled up from the pointed position.
Further, while the data is being restored, the density
20 of the data is gradually increased in accordance with
the appearance of the data. Thus, the data (e.g., a
character image and/or a graphical image) can be
restored on the screen of the display unit 50 as if
the data well up realistically.

25 The elements of the data may be restored on
the screen in a rule which is inversely related to the
rule in which the elements are spirally deleted as
described above (e.g., the rule illustrated in Fig.
6). In this case, the elements of the data are
30 restored on the screen of the display unit 50 as if
the elements spirally welled up from the pointed
position.

In addition, the elements of the data may be
restored on the screen in a rule which is inversely
35 related to the rule illustrated in Fig. 5. In this
case, the elements of the data are restored on the
screen as if the elements radially welled up from the

1 pointed position.

In the process shown in Fig. 8, steps shown in Fig. 9 may be added after step S41 or substituted for step S41. In the following embodiment, for example, steps shown in Fig. 9 are substituted for step S41 shown in Fig. 8. Due to a process of steps shown in Fig. 9, the speed at which the elements of the data are restored is decreased in accordance with a degree of restoration of the elements.

10 After the sparse data is obtained in step S40 shown in Fig. 8, the CPU starts a process of steps shown in Fig. 9. Referring to Fig. 9, the CPU reads a count value i of an internal counter in step S51. The internal counter has been already initialized at "0".
15 The CPU determines, in step S52, whether the count value i is less than a first reference value i_0 ($i < i_0$). If the count value i is less than the first reference value i_0 , the count value i is incremented by one ($i \rightarrow i+1$) in step S53. After this, step S42
20 shown in Fig. 8 is executed.

Until the count value i of the internal counter reaches the first reference value i_0 , step S40 shown in Fig. 8 and steps S51, S52 and S53 shown in Fig. 9 are repeatedly executed. As a result, a
25 process for restoring the data in step S40 is repeatedly executed at short intervals.

When the count value i of the internal counter reaches the first reference value i_0 , the CPU further determines, in step S54, whether the count
30 value i of the internal counter is within a range between the first reference value i_0 and a second reference value i_1 greater than the first reference value i_0 ($i_0 \leq i < i_1$). If the count value i is within the range ($i_0 \leq i < i_1$), a delay timer having a second
35 delay time (2) is activated in step S55. After the second delay time (2) elapses, the CPU causes the count value i of the internal counter to increment by

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In the first embodiment as described above,

1 the data processing apparatus is formed using the
general purpose computer. However, the present
invention is not limited to this. The data processing
apparatus according to the present invention may be
5 formed using a portable remote computer terminal and
other types of computers.

A description will now be given of a second
embodiment of the present invention.

A data processing apparatus according to the
10 second embodiment of the present invention is
functionally formed as shown in Fig. 10. Referring to
Fig. 10, the data processing apparatus 2 has a display
unit 40, a pointing device 41 and an input/output
control unit 42. The data processing apparatus 2
15 further has a menu item management unit 43, a
determination unit 44, a display control unit 45, a
detecting unit 46 and a selecting unit 47.

The display unit 40 is formed, for example,
using a LCD (Liquid Crystal Display) panel. The
20 pointing device 41 is used to point to positions on a
screen of the display unit 40. The input/output
control unit 42 performs interface processes for the
display unit 40 and the pointing device 41.

The menu item management unit 43 manages
25 menu items which are to be displayed on the screen of
the display unit 40. The determination unit 44
determines whether or not an instruction for
displaying menu items has been issued. The display
control unit 45 causes menu items managed by the menu
30 item management unit 43 to be displayed on the screen
of the display unit 40 one by one in turns. The
detecting unit 46 detects that a pointing operation
using the pointing device 41 is interrupted. The
selecting unit 47 selects a menu item to be activated.

35 In the data processing apparatus which is
functionally configured as described above, the
following processes are formed.

1 When the determination unit 44 determines
that an instruction for displaying menu items has been
issued, the display control unit 45 causes the menu
items managed by the menu item management unit 43 to
5 be displayed in an area including a position pointed
to by the pointing device 41 on the screen of the
display unit 40 one by one in turns. In this state,
when the detecting unit 46 detects that the pointing
operation using the pointing device 41 has been
10 interrupted, the selecting unit 47 selects a menu item
which is displayed at this time as an item to be
activated.

 According to the data processing apparatus
of the second embodiment of the present invention as
15 described above, in response to the pointing operation
using the pointing device 41, the menu items are
displayed on the screen of the display unit 40 one by
one in turns. In response to interruption of the
pointing operation, a single menu item to be activated
20 is selected. Since all the menu items which can be
selected are not simultaneously displayed on the
screen, an area in which the menu items are displayed
on the screen can be narrowed. In addition, an
operation for selecting a menu item from among a
25 plurality of menu items can be simplified. Thus, a
plurality of menu items can be displayed on a limited
area of the display screen so as to be easily selected
by a user.

 The data processing apparatus according to
30 the second embodiment of the present invention as
described above may be formed, for example, using a
portable remote computer terminal. In this case, the
computer system has hardware as shown in Fig. 11.
Referring to Fig. 11, the computer system 200 has a
35 display unit 50 such as an LCD (Liquid Crystal
Display) panel and a pointing device 51 such as a pen-
touch input device. The computer system 200 further

1 has a controller 57 and a memory unit 58.

The controller 57 includes a CPU (Central Processing Unit) which performs various processes corresponding to the functions of the data processing apparatus as described above. The memory unit 58 includes various types of memories, such as a RAM, a ROM and a memory card (a ROM card and/or a RAM card), for storing various types of data and programs. A menu file used to manage menu items to be displayed on the screen of the display unit 50 is stored in a memory included in the memory unit 58.

A program corresponding to the functions of the data processing apparatus described above has been previously installed in the ROM of the memory unit 56. The program may be supplied as a part of an application program, such as a word-processing application program, to the portable remote computer terminal (the computer system 200) using a ROM card. The CPU in the controller 57 executes processes in accordance with the program, stored in the memory unit 58, corresponding to a procedure shown in Fig. 12.

Referring to Fig. 12, the CPU causes a menu bar to be displayed on the screen of the display unit 50 in step S60. The menu bar is formed, as shown in Fig. 13, of menus (EDIT, PRINT, FILE, GRAPHICS and TOOL). Menu items included in the respective menus (EDIT, PRINT, FILE, GRAPHICS and TOOL) in the menu bar are managed in the menu file stored in the memory unit 58. For example, the menu "EDIT" includes menu items "MOVE", "COPY", "INSERT", "DELETE", etc. In a state where the menu bar is displayed on the screen of the display unit 50, the CPU is waiting for a pointing operation for pointing to one of menus in the menu bar in step S61. This pointing operation means an instruction for displaying menu items. A user performs the pointing operation which points to, for example, a menu "EDIT" in the menu bar using the

After this, the CPU causes an internal timer to be reset to "0" ($T=0$) and to start in steps S63 and S64. The CPU then determines, in step S65, whether or not the pointing operation is interrupted, that is, whether or not the pointing device 51 (a touch-pen) is separated from the screen of the display unit 50. After this, the CPU further determines, in step S66, whether or not a timer value T of the internal timer reaches a reference value T_0 . Until the timer value T reaches the reference value T_0 , the CPU is repeatedly determining, in step S65, whether or not the pointing operation is interrupted. If the timer value T reaches the first reference value T_0 ($T \geq T_0$) before the pointing operation is interrupted, the CPU causes the menu item displayed on the screen to be changed from the first menu item "MOVE" to the second menu item "COPY" in step S67.

For example, when the pointing operation is

1 interrupted, that is, when the pointing device 51 is
separated from the screen of the display unit, the CPU
causes a menu item which is displayed at this time to
be selected in step S68. As a result, the CPU
5 recognizes that an instruction corresponding to the
selected menu item has been received.

The data processing apparatus according to
the second embodiment of the present invention is
formed in the portable remote computer terminal.
10 However, the present invention is not limited to this.
The processing apparatus having the functions
described in the second embodiment may be formed in a
general purpose computer (e.g., a personal computer).

The present invention is not limited to the
15 aforementioned embodiments, and other variations and
modifications may be made without departing from the
scope of the claimed invention.

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